

Benjamin G. Pierce

pierce@case.edu – (614) 787-8389 – Cleveland, OH – bp0017.github.io

RESEARCH INTERESTS

Photovoltaics Machine Learning Computer Vision Distributed Computing

EDUCATION

Case Western Reserve University

B.S. Computer Science

Aug 2017 – May 2021

Cleveland, OH

- GPA: 3.6
- Coursework: Algorithms, Databases, Machine Learning, Theoretical Computer Science, Cryptology, Linear Algebra, Probabilistic Graphical Models, High Performance Computing, Computational Perception
- Minor in Applied Data Science

EXPERIENCE

Sandia National Laboratories

R&D Systems Research Analyst

Present

Albuquerque, NM

Project: Improving Single Axis Tracking Algorithms Using Sky Imagery and Machine Learning

- Supported via by DOE Technology Commercialization Fund (\$500K)
- Objective: Improve energy yield of single axis trackers via a new, machine learning based control algorithm that takes sky images as input
- Cleaned data set of over 100K images (months of 1 minute interval data) in Sandia HPC environment
- Created novel multi-input convolutional neural network to find angle of maximal irradiance

Solar Durability and Lifetime Extension Center

Research Assistant

Aug 2018 – May 2021

Cleveland, OH

Project: Feature Extraction and Unsupervised Learning on Electroluminescence Images

- Faculty: Roger French, Jennifer Braid
- Objective: Use unsupervised learning to classify types of degradation of solar modules through electroluminescence images in a dataset of 11,000 images
- Experiments: Took electroluminescence measurements on mini-modules and adjusted data processing step to enable further analysis
- Extracted local features (blots of corrosion, darkening) using algorithms such as SIFT and KAZE
- Found module-level features with Haralick/GLCM features and specialized extraction methods
- Modeled local features using bag-of-words model, and applied hierarchical clustering to identify classes

PUBLICATIONS

- Benjamin G Pierce, Ahmad Maroof Karimi, Jiqi Liu, Roger H French, and Jennifer L Braid. "Identifying Degradation Modes of Photovoltaic Modules Using Unsupervised Machine Learning on Electroluminescence Images" *IEEE Photovoltaics Specialists Conference 2020*

- Carolina M. Whitaker, **Benjamin G Pierce**, Ahmad Maroof Karimi, Roger H French, and Jennifer L Braid. "PV Cell Cracks and Impacts on Electrical Performance" *IEEE Photovoltaics Specialists Conference 2020*
- Ahmad Maroof Karimi, Justin S Fada, Nicholas A Parrilla, **Benjamin G Pierce**, Mehmet Koyutürk, Roger H French, and Jennifer L Braid. "Generalized and Mechanistic PV Module Performance Prediction from Computer Vision and Machine Learning on Electroluminescence Images." *IEEE Journal of Photovoltaics*
- M. Adachi, S. Sonoko, A. Kanbara, L. G. Wilson, **B. G. Pierce**, A. M. Karimi, R. H. French, J. L. W. Carter, H. Fukuyama, AlN growth behavior on Ni-Al liquid solutions, (2019).
<http://www.ioffe.ru/iwumd4/invitedspeakers.html>
- Carolina M. Whitaker, **Benjamin G. Pierce**, Roger H. French, and Jennifer L. Braid, "Properties of PV Cell Fractures and Effects on Performance of Al-BSF and PERC Modules," presented at the 48th PVSC, Virtual, 2021.
- **Benjamin Pierce**, Jennifer L. Braid, Joshua S. Stein, Jim Augustyn, Daniel Riley, "Solar Transposition Modeling via Deep Neural Networks with Sky Images", *IEEE Journal of Photovoltaics*, submitted following invitation.
- A. M. Karimi, **B. G. Pierce**, J. S. Fada, N. A. Parrilla, R. H. French, and J. L. Braid, PVimage: Package for PV Image Analysis and Machine Learning Modeling. 2020. Accessed: Feb. 28, 2020. [Online]. Available: <https://pypi.org/project/pvimage/>

PROJECTS

- Web-scraping online sports databases to track and predict player growth from the NCAA to the NBA, published on data.world with over 300 bookmarks
- Web marketplace with Flask frontend using MySQL backend
- Peer-to-peer local area network IDE for Python
- Raspberry Pi based handheld license plate identification device

AWARDS

DOE Science Undergraduate Laboratory Internships (SULI)	Lawrence Berkeley National Lab
Offered SULI funding for Summer 2020, declined for Sandia	May 2020
Computer and Data Sciences Research Award	CWRU
To the senior demonstrating exceptional research potential	May 2021
Herbold Scholar	CWRU
Awarded funding for Master's program at CWRU	May 2021

TECHNOLOGIES

Programming Languages	Python, Julia, R, Java, C, bash
Libraries	Tensorflow/Keras, NumPy, sklearn, scipy, openCV, pandas
Databases	Hadoop2/Hbase, MySQL
Other	High-performance computing, L ^A T _E X

ACTIVITIES

Association for Computing Machinery	Student Member, 2019
Institute of Electrical and Electronics Engineers	Student Member, 2020
Study Abroad	Cape Town, South Africa, Summer 2018